

XI. *Observations on the Cæstridæ.* By the late
W. SELLS, Esq.

Part I.—[Read October, 1837.]

It having appeared to me desirable to extend the observations, and to verify the facts which are detailed in Mr. Bracy Clark's valuable Essay on the Bots of Horses and other Animals, which was published in 1815, I took steps, in the spring of this year, for procuring larvæ of the *Gasterophili* from a horse-slaughterer and several horse-keepers who live in my neighbourhood; and as my applications to them have not been altogether unprofitable, I beg leave to submit to the notice of the Society these first results of my pursuit of this interesting department of Entomology.

It being of considerable importance that in all inquiries into the economy of insects, respecting which our present state of knowledge is imperfect, we should, as much as possible, give the precise dates connected with the periods of their transformations, both as useful facts in themselves, and as guides to those who are led to take up the same course of observation, I will first give a copy of the entries in my journal which have reference to this subject.

May 12, 1837.—Received a specimen of a nearly full grown larva of *Gasterophilus hæmorrhoidalis*, or red-tailed Bot fly; it was found in recently dropt dung, was active and lively, showing no little muscular power by making a considerable spring from the desk on which it was placed for the purpose of being drawn while in a living state.

May 16.—Received three dozen of apparently full grown larvæ of *Gasterophilus equi*; but it is probable they are all dead, in consequence of their close stowage in the pill-box provided for their reception (as afterwards proved to be the case): also one larva of *hæmorrhoidalis*, which had been plucked from the verge of the anal passage.

June 25.—Received three larvæ of *hæmorrhoidalis* which appear full grown, and will most likely go into pupa; the man who sent them said there were two more adhering to the horse's rectum, which he had tried carefully to pull off, but their heads were separated in the attempt, the others had dropped in the dung.

June 27.—Received a larva which I considered at the time to be one of *G. equi*, but it turned out afterwards to be *G. veterinus*, and a female.

June 29.—Received two larvæ of *hæmorrhoidalis* and one of *equi*: after this date I did not obtain any further contributions of larvæ which had traversed the intestines of the horse. The whole of them were placed in some damp mould in a garden pot, which was tied over with gauze, and on August 3rd two females of *hæmorrhoidalis* came out of pupæ, and also a beautiful female of *G. veterinus*.

August 13.—Two male flies of *hæmorrhoidalis* appeared.

August 14.—One more specimen of *hæmorrhoidalis* came out, being a very fine male, and the valvular openings of its pupa case are not detached, as generally happens with one or both of them.

As the number of larvæ which completed their transformations corresponds with that of those which were received upon, and after, the 25th of June, and which were all, except two, of *G. hæmorrhoidalis*, I conclude that those brought on May 12th and 16th, and which were nearly all presumed to be *G. equi*, might, in addition to injury from pressure, have passed prematurely from the stomach of the horse, owing to some accidentally disturbing cause; therefore, the time of these creatures quitting their seat of nurture is about the last week of June, and as they appeared in the fly state from the 3rd to the 14th August, the intervening period was about seven weeks.

The following entry appears in my journal under date of June 1:—"Received from Mr. H. two pieces of the stomach of an old horse, which he killed to-day by order of the owner, as, notwithstanding it had been turned out at pasture for some time, it was unable to perform any work." One of the portions, which is entirely of the villous structure of the stomach, contains a cluster of forty-eight larvæ of *Gast. hæmorrhoidalis*, and the other portion, which is half cuticular and the remainder villous, has six larvæ attached to the former and twenty-four upon the latter surface, in all thirty, of the larger kind of *Gast. equi*; the whole are nearly full grown and all alive, upon detaching one of them it speedily refixed itself.* The villous portions of the stomach to which the bots fixed themselves are much altered in organization, being generally thickened, somewhat inflamed, and discoloured in patches with blood, several spots are ulcerated, forming cavities

* In order to keep the parts sweet, and cleanse them from some particles of vegetable matter and a good deal of mucous, they were, in the first instance, and that immediately, put into strong salt and water for a day or two, when it was found that even this pickling had induced but very few of them to relinquish their hold.

dipping into the muscular tissue, with raised callous edges, containing a kind of lardaceous matter; at most of the points where the insect has imbedded its head and part of its body, a circular warty enlargement appears, and upon squeezing the surrounding hardened portion where a larva is deeply lodged, some of the thick white substance alluded to was forced out, but without compelling the bot to quit its hold: on the other hand, the cuticular portion which had been attacked exhibits but slight comparative injury. The preceding observations, in connexion with the physiological views which could hardly fail to present themselves, have led me to a conclusion quite at variance with the opinions of Mr. B. Clark as to the mode in which the bot is nourished, but which it may not unfairly be presumed has been long since modified by that gentleman's further consideration and enlarged experience.

The horse's stomach is a large macerating bag for the vast quantities of vegetable food of which it is the recipient, and where its digestion is but partially accomplished, that process being completed in the expanded head of the colon. Now Mr. Clark's idea of the bots feeding either upon the gross vegetable substances, or the watery juices obtained from them in union with the secretions of the stomach, (and which, when in a state to be allowed to pass out of it by the pylorus, is called chyme,) is, to my mind, entirely erroneous. The bot, when once fixed by the peculiar cross-locking of its tentacles, rarely quits its hold until full grown and ready to pass into pupa, and no doubt is mainly supported by sucking fluids from the vascular structure of the horse's stomach, and imbibing matters secreted in consequence of the wound it inflicts upon the coats of that organ, and where, as a foreign body, it proves a constant irritant; this will account for the common failure of attempts made for the removal of bots by the administration of large doses of opium, tobacco, aloes, calomel, or castor oil, as these several substances do not in that case become mixed with the proper food of the insect.

As regards the probable effects of the *Gasterophili* upon the health of the animals which they inhabit, the opinion which I shall venture to advance on this matter will tend to prove that I have not been able to take quite so favourable a view of the innocence, and, indeed, positive salubrity, of these inmates of the digestive apparatus of the horse, as we find in Mr. Clark's Essay; where, in addition to many sensible and scientific remarks, the author gives some interesting illustrations of the importance of counter-irritants, as the happily provided means of preventing

some diseases, and of retarding the progress of others ; of the former, he gives us an example from Linnæus, “ that the gnawings of lice in the head prevent coughs, wheezings, blindness, &c.,” and of the latter he instances “ the benefit derived from a copious breeding of worms in children of cachectic habits.” Mr. Clark appears to include bots in the above class of remedies, and considers that they are not only not injurious in themselves, but that, through the stimulus they impart to the stomach in the discharge of its function, they prove really salutary—as the harmless substitutes for actual disease. I have no doubt that where bots are in moderate numbers, and attached to the cuticular coat of the stomach, they interfere little or nothing with the digestive process, or in any way affect the health or vigour of the horse, as, after a certain time, they take their departure, when the self-adjusting vital powers of the organ will speedily restore to a perfectly sound state the parts of it to which these parasites had so long been living appendages. On the other hand, when large quantities of them are found congregated upon the *villous* coat, especially if located near the distal or pyloric opening of the stomach, which is the most sensible and irritable part of it, and there produce such effects as have been described in a former part of this paper, it becomes impossible to consider them otherwise than injurious, and that they must, under such circumstances, impair materially the health and condition of the animal whose organ of nutrition is thus formidably attacked. Mr. H., an old veterinarian, an intelligent man and of very extensive experience in the diseases of horses, assures me that in two instances where he had opened the bodies of horses which had died from internal causes, he found the coats of the stomach perforated by bots, so that he could pass the tip of his little finger through the opening, and through which a portion of its contents had escaped into the cavity of the abdomen. Bots were present in great numbers, and must in these cases (if his statement be true) have, most undoubtedly, been the immediate cause of death ; at the same time, it must be remembered, that such a fact is not in accordance with the usual processes of nature during the progress of disease affecting internal organs.

Part II.—[Read 1 October, 1838.]

WITH the return of the proper season this year, I resumed my attention to the economy of the *Gasterophili*, and extended my observations to the proceedings of *Æstrus bovis*, the only species of that genus respecting which I was at all likely to be successful, as all my inquiries concerning *Æstrus ovis*, among intelligent butchers, were answered by saying that since the very general preference of the breed of polled sheep, the maggot formerly found internally near the origin of the horn had become very uncommon.

The Entomological campaign of the current year, as respects the insects under consideration, having now nearly terminated, I beg leave to submit such results of the same, in that department, as are in my hands, to the notice of the Society.

As regards the *Gasterophili*, between the middle of May and the end of July, I received many specimens of *Hæmorrhoidalis*, which made their appearance in the fly state at corresponding dates up to the end of August. These larvæ were chiefly removed by the finger of the collectors from the verge of the anus of the horse, and may thus be easily obtained, while those of *G. equi* are far more difficult to procure, as they drop with the dung, and are frequently picked up by poultry. I received one specimen of the latter as late as August 8th, which buried itself in the mould nearly two inches, but not having come out has most likely perished.

On August 27th a fine specimen of *G. salutiferus* (var. β Clk.) came forth, but owing to the vessel which contained it being incautiously exposed to a powerful sun before the wings were quite dry, the insect, being very vigorous and active, damaged them considerably during my absence from home.

I will now give my observations upon *Æstrus bovis* in a condensed form, according to the order in which they appear in my journal.

May 4.—Early in this month I commenced my walks among the farms in my neighbourhood, and visited several dairy establishments, and lost no time in selecting the more promising cases for practising the method recommended by the able author of the Essay on Bots, for the capture of the full grown larva. I had the œstral tumours, at various periods, on several cows, carefully shaved and dressed in the most approved Clarkyan mode, but, although the operation was performed “*secundum artem*” with great care, and the plaster

was powerfully adhesive, it did not, in any instance, prove successful; owing, chiefly, to the cows being turned out at night, when, from some disturbing cause or other, the plastered leather became gradually detached, and I failed to *bag* my game in the little muslin pouch provided for its reception. Having foreseen that the chances of failure in this way were very great, and as it was evident that the vulgar mode of squeezing or popping out the larva through the small opening in the hide, by which the insect obtains air for respiration, must prove fatal to it, I determined to enlarge the orifice very freely by means of a director and probe-pointed bistoury, and then pressing the sides of the sac firmly and carefully the safe delivery of the insect was easily effected: by this plan I have been fortunate enough to obtain, as will appear in the sequel, seven specimens of the fly.

May 11.—The larvæ removed to-day were most of them of premature growth, being of a beautiful pearly white, and others of a very pale tawny colour with darker patches.

May 24.—Several specimens of full growth were removed during the last fortnight, and I noticed for the first time, the collapsed state of the swellings from which the insects had taken their departure.

June 7.—The preceding two weeks have procured me many specimens, some quite white and others dark tawny.

July 23.—Continued procuring larvæ up to this day; with the exception of a few remaining in two or three cows, they have all quitted their snug warm quarters in the midst of plenty, to hazard the many casualties of a new state of existence. The greatest number I noticed in any one animal was about 100; they were in a heifer which had been much turned out; I succeeded but in one instance to obtain a specimen, which had come out spontaneously; the larvæ were placed on fine mould, kept slightly damp, in a garden flower-pot, and covered with gauze, the perfect insects appeared at the following dates:—

July 10.—A male, the shell from which it came forth contained a good sized drop of a limpid, brownish, purulent fluid.

July 16.—A very fine male.

July 25.—A female.

August 2.—A female.

August 20.—A female, the larva of which having been put aside by itself on July 11 proves the intermediate stage to have been exactly forty days.

August 27.—A fine male.

And same day raised the operculum of another, and found the imago perfect, and shrouded within a very delicate thin membranous pellicle, interposed between itself and the inside of the strong shell which is formed by the desiccation and hardening of the thick cutis of the larva.

The resemblance of the front or face of the head of *Æstrus bovis*, particularly in the female, to the countenance of the monkey tribe, is very curious and striking; the short setaceous antennæ proceed from two hemispherical naked shining bodies, whose lighter colour in the circumference, and darker hue in the middle, completely simulate a pair of eyes, placed in hollows not unlike sockets; immediately below these prominences the face is denuded of hair, and has the appearance of a monkey's skin; then there is a naked ridge which rises in the medial line proportionally higher than the upper part of the nose in the monkey; all the lower part of the face is very hairy.

The telescopic structure of the ovipositor in the female was beautifully distinct, especially in a recent state; it consists of two highly polished cylindrical joints, of an osseous structure, connected one with the other, and the larger to the apex of the abdomen by a strong ligamentous tissue: at the aperture of the tube there protruded a soft papilla, being the termination of the muscular and membranous apparatus enclosed within the horny tube, and through which the ova pass securely to the destined place of deposit, which is doubtless, by the infliction of a wound, in the skin of the animal.

My specimens confirm the correctness of Dr. Leach's conjecture that the insect he took on the heath near Plymouth, and first named *Æstrus ericetorum*, is, as he afterwards believed it to be, the male of *Æstrus bovis*.
